Case Report

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CASE STUDY OF LEECH APPLICATION IN DIABETIC FOOT ULCER

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ABSTRACT
In diabetes, slight injury to the glucose laden tissue may cause chronic infection and ulcer formation. About 15% of all diabetic patients develops foot ulcer in their life time. The etiological factors include increased sugar level, diabetic micro angiopathy and peripheral neuropathy.
Mainstay of treatment includes antibiotics, debridement, and local wound care and footwear improvisation. In spite of all advances in health sciences, statistics reveals that about 3% patients yet have to undergo lower limb amputation.
In Sushrut samhita, we get the most scientific description of wound and its management. Similarly, Sushrut has given the utmost importance to Bloodletting therapy and considered Leech as the most unique and effective method of bloodletting even in infected wounds and abscesses.
Aforesaid description led us to try Leech therapy in Diabetic foot ulcer. Patient with Diabetic foot ulcer was advised to continue anti diabetic medicine along with weekly application of Leech around the ulcer which was followed by dressing with Nimb-Haridra oil.
This Leech therapy proved very effective and the ulcer healed completely within 30 days.
However, further evaluation is required to be done by taking a large sample size to prove its significance in treating Diabetic foot ulcer and avoiding lower limb amputation.
Key words: Diabetic foot ulcer, Sushrut samhita, Jaloka,Vran, Leech therapy.

INTRODUCTION

The term 'Diabetic foot' is somewhat a misnomer, as the condition has been defined as a group of syndromes that can involve Neuropathy, Ischemia and Infection, with the neuropathic type being the most common. Diabetic ulcers tend to occur most commonly on the plantar weight bearing surfaces of the foot underneath the pressure point.

Epidemiology

Most common cause of diabetic patient to get hospitalized is Diabetic foot ulcers. As many as 15% of people with diabetes will develop foot ulceration and its related complications[1] and 3% will have a lower limb amputation[2].

Why does this happen?

Diabetic foot ulcers basically occur due to barefoot walking, absence of sensations and ignorance. However, the prime etiological factors are-

- Increased Sugar- In diabetes slight injury to the glucose laden tissue may cause chronic infection and ulcer formation. Also, increased sugar favours' propensity of bacteria to multiply and cause severe spreading infection.
- Diabetic Micro angiopathy**-** Ulceration in diabetes may be precipitated by ischemia due to diabetic atherosclerosis, as a result of which blood supply to the tissues is grossly compromised right down to the distal most point.
- Diabetic Neuropathy- Since the peripheral nerves are affected, there are diminished or no sensations, as a result the patient experiences no pain, sustains injuries and hence do not seek medical advice.

Diagnostic Interpretation

For the confirmation of diagnosis certain other condition causing delayed healing are considered like Atherosclerosis, Chronic venous insufficiency, Vasculitic neuropathies, Metabolic neuropathies, autonomic neuropathy and radiculopathy .

In all the Diabetic patients, thorough foot examination especially around nail beds and in between webs of fingers to check any swelling, rash, cut or any underlying fungal infection is a mandatory. However, advanced diagnostic modalities like - Hand-held Doppler, Biothesiometry and Podiascan are also helpful for the confirmation of diagnosis.

'Gold Standard' for wound healing in Diabetes Mellitus

The key to successful wound healing is regular podiatric medical care to ensure the following 'gold standard' of care - lowering blood sugar, appropriate debridement of wounds, treating any infection, reducing friction and pressure and restoring adequate blood flow.

Prognosis

30 % of DM neuropathic ulcers receiving standard care heals within 20 weeks (Note that the patient's age, duration of the wound and other risks may change these results). However, the recurrence rate is 66% and the amputation rate rises to 12%.

Statistics reveals that among people with diabetes, 1 in 20 will develop a foot ulcer and 1 in 100 will require amputation annually.

Ayurvedic Prospective

Diabetic foot ulcer can be correlated with 'Madhumehaj Vrana' described in Sushrut samhita.

Samprapti (Pathogenesis) of Diabetic Ulcer
In Madhumeh the lower limbs vessels become weakened and unable to expel Doshas. This leads to accumulation of doshas (Meda and Rakta along with other dosh-dushyas) followed by formation of Prameha pidika which converts into wounds after putrification i.e. Diabetic ulcer.

Prognosis of 'Madhumehaj vrana'
While describing the prognosis of 'Vrana' in Sutra sthan chapter 23, Sushrut had stated that the 'Madhumehaj Vrana' i.e. Diabetic ulcers are Kashtasadhya (difficult) for management. Further, Sushrut specified that the wounds over the lower limb too delays in healing.

About Leech Therapy
It is considered most unique and most effective method of bloodletting.
It can be tried in all mankind including Females, Children, Old and Patients having poor threshold to pain.
It drains impure blood, useful in Pitta dushit Rakta diseases, various skin disorders and all types of inflammatory conditions.

References of indication of Leech Therapy in Wounds
In Sushrutsamhita Chikitsa sthan, chapter 12 and 16, Sushrut has advocated that Bloodletting by means of Leech can be practiced in all inflammatory, suppurative and painful conditions to relieve pain and inhibit suppuration including that of Diabetic ulcerative lesions.

Table 1: components of medicinal leech (*Hirudo medicinalis*) saliva

Hirudin	Inhibits blood coagulation by binding to thrombin
Calin	Inhibits blood coagulation by blocking the binding of von Willebrand factor to collagen. Inhibits collagen-mediated platelet aggregation
Destabilase	Monomerizing activity. Dissolves fibrin. Thrombolytic Effects
Hirustasin	Inhibits kallikrein, trypsin, chymotrypsin, neutrophilic cathepsin G
Bdellins	Anti-inflammatory. Inhibits trypsin, plasmin, acrosin
Hyaluronidase	Increases interstitial viscosity. Antibiotic
Tryptase inhibitor	Inhibits proteolytic enzymes of host mast cells
Eglins	Anti-inflammatory. Inhibit the activity of alpha-chymotrypsin, chymase, substilisin, elastase, cathepsin G
Factor Xa inhibitor	Inhibits the activity of coagulation factor x a by forming equimolar complexes
Complement inhibitors	May possibly replace natural complement inhibitors if they are deficient
Carboxypeptidase A inhibitors	Increases the inflow of blood at the bite site
Histaminelike substances	Vasodilator. Increases the inflow of blood at the bite site
Acetylcholine	Vasodilator
Anesthetics subsctance	Anesthetic

CASE STUDY REPORT

Aims and objective of case study

- To evaluate clinical efficacy of ' Leech therapy' in the patient with Diabetic foot ulcer.
- Refining Clinical technique (Leech therapy)

Type of study: Observational Single Case Design without control group
Study center: Dr.D.Y.Patil Ayurvedic Hospital, Nerul, Navi Mumbai.

Study Details (C.R.F. Protocol in brief)
Age- 45 yrs , **Gender-** Male, **Religion-** Hindu
Occupation- Bussiness (Hotel) **Diet-** Veg. and Non Veg (Both)

Chief complaints and duration since 2 months -
Non healing Ulcer over both foot (Planter aspect)
Often Blood discharge mixed with Mild pus and unpleasant smell
Pain and Swelling over both foot

Brief History (Including Onset and Progress)
Patient is a case of controlled DM (On oral Antidiabetic drugs) - since 5 years. He visited Tirupati (Shri Balaji temple) and walked with bare foot, 2 month back. Later on, after 2 days he developed blisters over both planter area which turned into Ulcer. He took treatment for the same at private clinic but wound got infected and was not healing in spite of treatment for around 2 months hence he came to Dr. D.Y.Patil Ayurvedic Hospital for further management.

Day 1
General Examination
All the vital para meters were within normal limits. Patient was haemodynamically stable except slight increase in blood sugar level.
Blood sugar – Fasting 115 mg/dl , PP 186 mg/dl
Urine sugar Absent, Albumin + present
X-ray both foot (AP/LAT/OBLIQUE)- No bony involvement



Figure 1: Clinical presentation on Day-1

Day 2
Local Examination
Inspection
Site – Foot planter aspect
Size- Length 4 inch , **Width** -3 inch **Depth**- ½ cm
Shape - Irregular / eliptical
Edge – Rough, Irregular with fibrosed tissue
Floor – Unhealthy with less granulation tissue and slough
Discharge- Often Blood discharge mixed with Mild pus which needs daily dressing

Smell- Tolerable, unpleasant smell
Surrounding area- Mild inflammation and congestion
State of Vrana- Ruhyaman (partially Dushta)
Classification - Grade 1: superficial ulceration **with infection**
Palpation
Edge and Margin - Tenderness ++,
Base - Tenderness ++
Local Temperature – Raised than BST
Local lymph nodes – Not palpable
Type of vrana – Aghatottar Shoth janya Agantuj (Traumatic) vrana.

Treatment Plan

After the assessment wound was washed with normal saline, there after 3 Leeches/wound were applied all around the lesion. When Leeches left the site by their own (after sucking blood for approximately 30 minutes) wound was cleaned with decoction of 'Triphla'. This was followed by dressing with gauge piece soaked in 'Nimb Haridra'oil. Finally, roll bandage was wrapped around.

Dressing was done on alternate day where as 'Leech therapy' was repeated weekly for 4 sittings. Total duration for treatment was 30 days and during the treatment assessment was done on Day-01, Day-07, Day-14, Day-21 and Day-30.

Patient was advised to continue Anti-diabetic medicine (Tab.Glucored -BD B/F). Changes occurred within the treatment period has been noted on criteria of assessment.

Effect of therapy on Sign and Symptoms

The effect of therapy was observed on different sign and symptoms of Diabetic ulcer. The signs considered were discharge, smell, edge, floor and size where as symptom considered was only pain.

Gradation Criteria for Assessment

Table 2: Gradation criteria for assessment of ulcer

Parameters for Assessment	Gradation criteria			
	0	+	++	+++
Size	No discontinuity of skin/ mucus membrane	¼ of previous area of the ulcer	½ of previous area of the ulcer	› ½ of previous area of the ulcer
Pain	No pain	Localized pain during movement but relieved on rest	Localized pain even during rest	Localized pain even during rest and also towards other side
Discharge	No dischare / Dry dressing	Scanty , occasional dischrge / Little wet dressing	Often discharge needs daily dressing	Profuse, continuous discharge needs frequent dressing
Smell	No smell	Bad smell	Tolerable , unpleasant smell	Foul and intolerable smell
Edge	Adhere edge	Smooth, even and regular edge	Rough, irregular edge	Angry look
Floor	Smooth, regular with granulation tissue/ No need for dressing	Rough, regular, mild discharge, less granulation tissue/ needs dressing	Unhealthy, less granulation tissue/ needs daily dressing	Unhealthy, no granulation tissue

OBSERVATION AND RESULT

Table 3: Observation of prognosis of ulcer as per assessment criteria

Sign and Symptoms	B.T.	A.T.			
	Day 1	7 days	14 days	21 days	30 days
Size	+++	+++	++	+	-
Pain	++	++	+	-	-
Edge	++	++	+	+	-
Floor	++	++	+	+	-
Discharge	++	++	+	-	-
Smell	++	+	-	-	-
Blood sugar - Fasting	115 mg/dl				110 mg/dl
- PP	186 mg/dl				170 mg/dl

RESULT

With 'Leech Therapy' the wound completely healed within 30 days, hence patient was cured.

Probable mechanism of action of Leech Therapy

- Leech application improves blood circulation and reduces congestion due to presence of Carboxypeptidase A inhibitors, Histamine like substances and acetylcholine, thus it corrects Diabetic Microangiopathy.
- Leech application has peripheral vasodilator effect due to presence of vasodilator constituent in the saliva which improves blood circulation which corrects 'Ischemia' due to Diabetic Atherosclerosis.
- Leech application has Anti-inflammatory action on nerves due to presence of substance like *Bdellins and Eglins* in the saliva hence corrects Diabetic Neuropathy.



Figure 2: Leech Application in Diabetic foot ulcer



Figure 3: Prognosis on Day 7



Figure 4: Prognosis on Day 14



Figure 5: Prognosis on Day 21



Figure 6: Showing completely healed Ulcer after 30 days

Probable mechanism of Action (Ayurvedic Perspective)

Vran Shodhan Effect

After Leech application expulsion of impure blood takes place, due to which Local vitiated Doshas (toxins and unwanted metabolites) are removed.

Vran Ropan Effect

Leech application facilitates fresh blood supply and promotes formation of 'Healthy Newer Tissues'.

Madhumeh Pacifying Effect

Bloodletting with Leech application pacifies Madhumeha i.e. it breaks the pathogenesis of 'Madhumeh' at cellular level, and inhibition of infection (In diabetes tissues are glucose laden which promotes propensity of bacteria to multiply), thus promotes wound healing.

'Nimb Haridra'oil has both 'Shodhan' and 'Ropan' property. Hence, it helps in simultaneous cleansing and healing of infected wounds.

However, further study with large sample size is required to evaluate impact of 'Leech Therapy' on promoting wound healing w.s.r. to Diabetic foot ulcer.

CONCLUSION

With 'Leech Therapy' the wound completely healed within 30 days, whereas statistic reveals that about 30% of DM neuropathic ulcers receiving standard care requires around 20 weeks for healing. Thus 'Leech therapy' proves to be effective, time saving, affordable and acceptable treatment. Though treating 'Diabetic foot' is a difficult task, we have managed to treat it with 'Leech Therapy' along with conventional (Ayurvedic) methods of wound care.

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